9th Class 2018

Math (Science)	Group-II	Paper-I
Time: 2.10 Hours	(Subjective Type)	Max. Marks: 60

(Part-I)

2. Write short answers to any Six (6) questions: 12

(i) Define transpose of matrix.

Ans A matrix obtained by changing the row into columns or columns into rows of a matrix is called transpose of that matrix. If A is a matrix, then its transpose is denoted by A^t.

(ii) Find additive inverse of the matrices:

$$\begin{bmatrix} \sqrt{3} & 1 \\ -1 & \sqrt{2} \end{bmatrix}$$

Ans Let:

$$A = \begin{bmatrix} \sqrt{3} & 1 \\ -1 & \sqrt{2} \end{bmatrix}$$

Then additive inverse of A is:

$$A = \begin{bmatrix} -\sqrt{3} & -1 \\ 1 & -\sqrt{2} \end{bmatrix}$$

(iii) Define multiplicative identity.

Ans Let A be a matrix. Another matrix B is called the identity matrix of A under multiplication if

$$AB = A = BA$$

(iv) Simplify: $5^{2^3} \div (5^2)^3$

Ans

$$= 5^{2^3} \div (5^2)^3$$
$$= 5^8 \div 5^6$$
$$= 5^{8-6}$$
$$= 5^2$$
$$\boxed{= 25}$$

(v) **Find the value of x, when:** $\log_{64} 8 = \frac{x}{2}$

Ans

$$\log_{64} 8 = \frac{x}{2}$$

$$(64)^{x/2} = 8$$

$$(8^2)^{x/2} = 8^1$$

$$8^x = 8^1$$

$$\boxed{x = 1}$$

(vi) **Define logarithm.**

Ans If $a^x = y$, then x is called the logarithm of y to the base 'a' and is written as $\log_a y = x$, where $a > 0$, $a \neq 1$ and $y > 0$.

(vii) **Simplify:** $\frac{x+2}{2x-3y} \cdot \frac{4x^2 - 9y^2}{xy + 2y}$

Ans

$$\frac{x+2}{2x-3y} \cdot \frac{4x^2 - 9y^2}{xy + 2y} = \frac{(x+2)[(2x)^2 - (3y)^2]}{(2x-3y)(x+2)y}$$

$$= \frac{\cancel{(x+2)}(2x+3y)\cancel{(2x-3y)}}{\cancel{(2x-3y)}\,\cancel{(x+2)}y}$$

$$\boxed{= \frac{2x+3y}{y}}$$

(viii) **Rationalize the denominator of** $\frac{1}{3 + 2\sqrt{5}}$.

Ans

$$= \frac{1}{3 + 2\sqrt{5}} \times \left(\frac{3 - 2\sqrt{5}}{3 - 2\sqrt{5}}\right)$$

$$= \frac{3 - 2\sqrt{5}}{(3)^2 - (2\sqrt{5})^2}$$

$$= \frac{3 - 2\sqrt{5}}{9 - 20}$$

$$= \frac{3 - 2\sqrt{5}}{-11}$$

$$\boxed{= \frac{-1}{11}(3 - 2\sqrt{5})}$$

(ix) **What is meant by remainder theorem?**

Ans If a polynomial $p(x)$ is divided by a linear divisor $(x-a)$ then the remainder is $p(a)$.

3. **Write short answers to any Six (6) questions:**

(i) **Find H.C.F. of the polynomials by factorization:**

$$x^2 + 5x + 6,\ x^2 - 4x - 12$$

Ans $x^2 + 5x + 6 = x^2 + 2x + 3x + 6$

$$= x(x + 2) + 3(x + 2) \Rightarrow (x + 2)(x + 3)$$

$x^2 - 4x - 12 = x^2 - 6x + 2x - 12$

$$= x(x - 6) + 2(x - 6) \Rightarrow (x - 6)(x + 2)$$

H.C.F = $x + 2$ (common factor)

(ii) **Solve the equation:** $\sqrt{3x + 4} = 2$

Ans

$$(\sqrt{3x + 4})^2 = (2)^2$$

$$3x + 4 = 4$$

$$3x = 4 - 4$$

$$3x = 0$$

$$\boxed{x = 0}$$

(iii) **Find the solution set of:** $|3x - 5| = 4$

Ans

$3x - 5 = 4$; $3x - 5 = -4$;

$3x = 4 + 5$; $3x = -4 + 5$

$3x = 9$; $3x = 1$

$x = \frac{9}{3}$; $x = \frac{1}{3}$

$x = 3$

(iv) **Define Cartesian plane.**

Ans The Cartesian plane establishes one-to-one correspondence between the set of ordered pairs $R \times R = \{(x, y) \mid x, y \in R\}$ and the points of the Cartesian plane.

(v) **Find the value of m and c of the line expressing in the form $y = mx + c$, $3 - 2x + y = 0$.**

Ans

$$y = mx + c \quad \text{(i)}$$

$$3 - 2x + y = 0$$

$$y = 2x - 3 \quad \text{(ii)}$$

By comparing both equations, we get

$\boxed{m = 2}$, $\boxed{c = -3}$

(vi) **Find the distance between pair of points:**

A(0, 0), B(0, –5)

Ans

$$d = \sqrt{|x_2 - x_1|^2 + |y_2 - y_1|^2}$$

$$|AB| = \sqrt{[(0-0)]^2 + [(-5)-0]^2}$$

$$= \sqrt{0 + (-5)^2}$$

$$= \sqrt{25}$$

$$\boxed{= 5}$$

(vii) **Find the mid-point between the pair of points:**

A(–4, 9), B(–4, –3)

Ans A (–4, 9), B (–4, –3)

$$P(x, y) = \left(\frac{-4-4}{2}, \frac{9-3}{2}\right)$$

$$P(x, y) = (-4, 3)$$

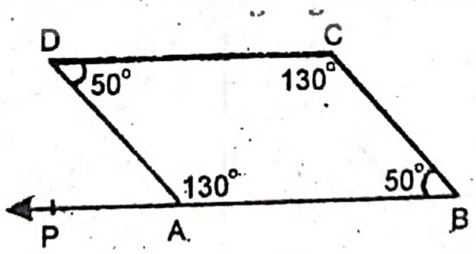
Mid-point of AB = (–4, 3)

(viii) What is meant by the congruency of triangles?

Ans Two triangles are said to be congruent, if there exists a correspondence between them such that all the corresponding sides and angles are congruent.

(ix) One angle of a parallelogram is 130°. Find the measures of its remaining angles.

Ans



$$\angle B \cong \angle C$$

$$m\angle A = 130^\circ$$

$$m\angle C = 130^\circ$$

$$m\angle B = 180^\circ - m\angle A$$

$$= 180^\circ - 130^\circ = 50^\circ$$

As

$$\angle B = \angle D$$

$$m\angle C = 50^\circ$$

4. **Write short answers to any Six (6) questions: 12**

(i) **If 3 cm and 4 cm are lengths of two sides of a right angle triangle, then what should be the third length of the triangle?**

Ans $(\text{Hypotenuse})^2 = (\text{Perpendicular})^2 + (\text{Base})^2$

$$(\text{Hypotenuse})^2 = (3)^2 + (4)^2$$
$$(\text{Hypotenuse})^2 = 9 + 16$$
$$(\text{Hypotenuse})^2 = 25$$
$$\sqrt{(\text{Hypotenuse})^2} = \sqrt{25}$$
$$(\text{Hypotenuse}) = 5 \text{ cm}$$

(ii) **Define bisector of an angle.**

Ans Angle bisector is the ray which divides an angle into two equal parts.

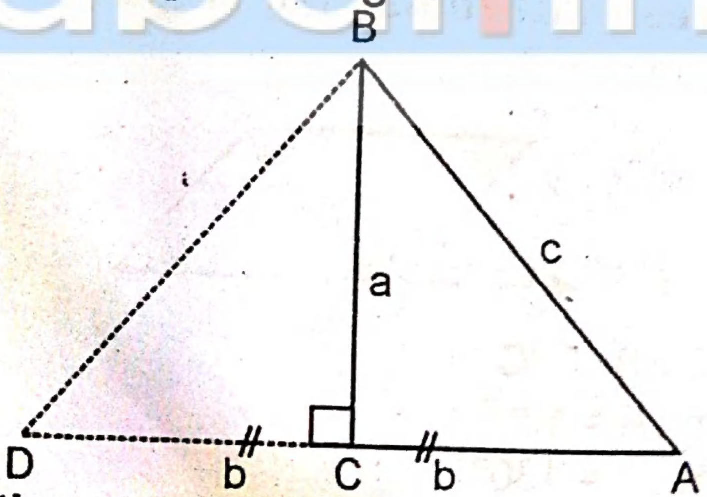
(iii) **Define proportion.**

Ans Equality of two ratios is defined as the proportion. if a : b = c : d, then a, b, c and d are said to be a proportion.

(iv) **State converse to Pythagoras theorem.**

Ans Converse of Pythagoras theorem is:

If the square of one side of a triangle is equal to the sum of the squares of the other two sides, then the triangle is a right-angled triangle.



(v) **Verify that the triangle having the measures of sides a = 1.5 cm, b = 2 cm, c = 2.5 cm are right-angled.**

Ans $a = 1.5$ cm , $b = 2$ cm , $c = 2.5$ cm

$$c^2 = a^2 + b^2$$

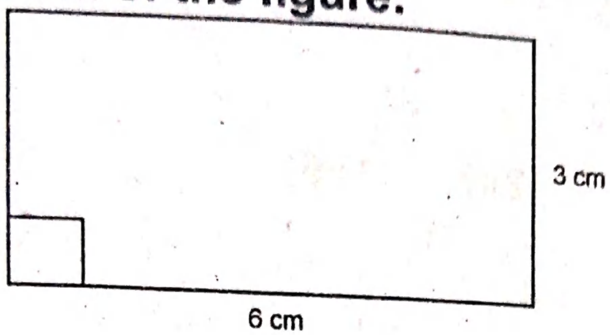
$$(2.5)^2 = (1.5)^2 + (2)^2$$
$$6.25 = 2.25 + 4$$
$$6.25 = 6.25$$

Hence measures are the sides of a triangle.

(vi) Define rectangular region.

Ans A rectangular region is the union of a rectangle and its interior.

(vii) Find the area of the figure:



Ans Length of rectangle = 6 cm
Width of // // = 3 cm
Area of // // = 6×3
= 18 Sq. cm

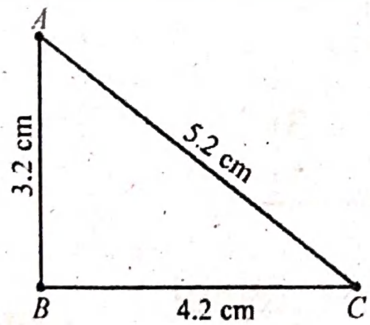
(viii) Define incentre.

Ans The internal bisectors of the angles of a triangle meet at a point called the incentre of the triangle.

(ix) Construct a ΔABC in which:

$$m\overline{AB} = 3.2 \text{ cm}, m\overline{BC} = 4.2 \text{ cm}, m\overline{CA} = 5.2 \text{ cm}$$

Ans



(Part-II)

NOTE: Attempt THREE questions in all. But question No. 9 is Compulsory.

Q.5.(a) Solve with the help of Cramer's rule: **(4)**

$$2x + y = 3$$
$$6x + 5y = 1$$

Ans

$$2x + y = 3$$
$$6x + 5y = 1$$

$$A = \begin{bmatrix} 2 & 1 \\ 6 & 5 \end{bmatrix}$$

$$A_x = \begin{bmatrix} 3 & 1 \\ 1 & 5 \end{bmatrix}$$

$$A_y = \begin{bmatrix} 2 & 3 \\ 6 & 1 \end{bmatrix}$$

$$|A| = \begin{vmatrix} 2 & 1 \\ 6 & 5 \end{vmatrix}$$
$$= (2)(5) - (1)(6)$$
$$= 10 - 6$$
$$= 4$$

$$x = \frac{|A_x|}{|A|} = \frac{\begin{vmatrix} 3 & 1 \\ 1 & 5 \end{vmatrix}}{4}$$
$$= \frac{(3)(5) - (1)(1)}{4}$$
$$= \frac{15 - 1}{4}$$
$$= \frac{14}{4}$$
$$x = \frac{7}{2}$$

$$y = \frac{|A_y|}{A}$$

$$y = \frac{\begin{vmatrix} 2 & 3 \\ 6 & 1 \end{vmatrix}}{4}$$
$$y = \frac{(2)(1) - (6)(3)}{4}$$
$$y = \frac{2 - 18}{4}$$
$$y = \frac{-16}{4}$$
$$y = -4$$
$$x = \frac{7}{2}, \quad y = -4$$

(b) Simplify: $\left(\frac{a^{2l}}{a^{l+m}}\right)\left(\frac{a^{2m}}{a^{m+n}}\right)\left(\frac{a^{2n}}{a^{n+l}}\right)$ (4)

Ans

$$= \left(\frac{a^{2l}}{a^{l+m}}\right)\left(\frac{a^{2m}}{a^{m+n}}\right)\left(\frac{a^{2n}}{a^{n+l}}\right)$$

$$a^{2l-(l+n)} \times a^{2m-(m+n)} \times a^{2m-(n+l)}$$

$$= a^{\cancel{2l}-l-m} \times a^{\cancel{2m}-m-n} \times a^{\cancel{2n}-n-l}$$

$$= a^{l-m} \times a^{m-n} \times a^{n-l}$$

$$= a^{l\cancel{-m}\cancel{+m}\cancel{-n}\cancel{+n}\cancel{-l}}$$

$$= a^{0}$$

$$\boxed{= 1}$$

Q.6.(a) Use log table to find the value of : (4)

$$\frac{0.678 \times 9.01}{0.0234}$$

Ans Let,

$$x = \frac{0.678 \times 9.01}{0.0234}$$

Taking log both side

$$\log x = \log \frac{0.678 \times 9.01}{0.0234}$$

$$= \log 0.678 + \log 9.01 - \log 0.0234$$

$$= \bar{1}.8312 + 0.9547 - (\bar{2}.3692)$$

$$= \bar{1}.8312 + 0.9547 - \bar{2}.3692$$

$$= -1 + .8312 + 0.9547 + 2 - .3692$$

$$= 2.4167$$

Take antilog

$$x = \text{Antilog } 2.4167$$

$$\boxed{x = 261}$$

(b) If $x + y = 7$ and $xy = 12$, then find the value of $x^3 + y^3$. (4)

Ans

$$x + y = 7$$

$$xy = 12$$

$$x^3 + y^3 = ?$$

Formula:

$$(x + y)^3 = x^3 + y^3 + 3xy\,(x + y)$$

Putting values,

$$(7)^3 = x^3 + y^3 + 3(12)(7)$$
$$343 = x^3 + y^3 + 252$$
$$343 - 252 = x^3 + y^3$$
$$91 = x^3 + y^3$$
$$\boxed{x^3 + y^3 = 91}$$

Q.7.(a) For what value of m is the polynomial

$$\mathbf{p(x) = 4x^3 - 7x^2 + 6x - 3m}$$

exactly divisible by x + 2? (4

Ans

$$P(x) = 4x^3 - 7x^2 + 6x - 3m$$

From $x + 2 = 0, \quad x = -2$

$$P(-2) = 4(-2)^3 - 7(-2)^2 + 6(-2) - 3m$$
$$= -32 - 28 - 12 - 3m$$
$$= -72 - 3m$$

If $x + 2$ is factor, then $R = 0$.

$$-72 - 3m = 0$$
$$-3(24 + m) = 0$$
$$24 + m = 0$$
$$\boxed{m = -24}$$

(b) Simplify to the lowest form: (4

$$\frac{2y^2 + 7y - 4}{3y^2 - 13y + 4} \div \frac{4y^2 - 1}{6y^2 + y - 1}$$

Ans

$$= \frac{2y^2 + 7y - 4}{3y^2 - 13y + 4} \div \frac{4y^2 - 1}{6y^2 + y - 1}$$
$$= \frac{2y^2 + 8y - y - 4}{3y^2 - 12y - y + 4} \div \frac{(2y)^2 - (1)^2}{6y^2 + 3y - 2y - 1}$$
$$= \frac{2y(y + 4) - 1(y + 4)}{3y(y - 4) - 1(y - 4)} \div \frac{(2y + 1)(2y - 1)}{3y(2y + 1) - 1(2y + 1)}$$
$$= \frac{(2y - 1)(y + 4)}{(3y - 1)(y - 4)} \div \frac{\cancel{(2y + 1)}(2y - 1)}{(3y - 1)\cancel{(2y + 1)}}$$
$$= \frac{\cancel{(2y - 1)}(y + 4)}{\cancel{(3y - 1)}(y - 4)} \times \frac{\cancel{(3y - 1)}}{\cancel{(2y - 1)}}$$

$$= \frac{y+4}{y-4}$$

Q.8.(a) Find the solution set of the equation: (4)

$$\frac{x}{3x-6} = 2 - \frac{2x}{x-2},\ x \neq 2$$

Ans

$$\frac{x}{3x-6} + \frac{2x}{x-2} = 2$$

$$\frac{x}{3(x-2)} + \frac{2x}{x-2} = 2$$

$$\frac{x+3(2x)}{3(x-2)} = 2$$

$$\frac{x+6x}{3x-6} = 2$$

$$\frac{7x}{3x-6} = 2$$

$$7x = 2(3x-6)$$

$$7x = 6x - 12$$

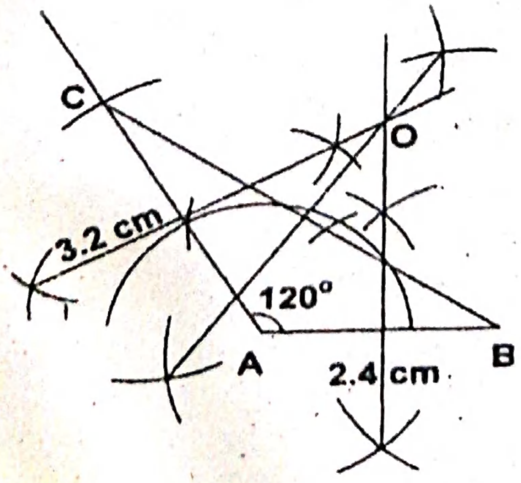
$$7x - 6x = -12$$

$$\boxed{x = \{-12\}}$$

(b) Construct ΔABC. Draw perpendicular bisectors of its sides: (4)

$m\angle A = 120^\circ$, $m\overline{AC} = 3.2$ cm, $m\overline{AB} = 2.4$ cm

Ans



Step of Construction:

(i) Take mAB = 2.4 cm.

(ii) Draw $m\angle BAC = 120^\circ$ at point A.

(iii) With centre at the point A and radius 3.2 cut $m\overline{AC} = 3.2$ cm.

(iv) Join B to C to complete the ΔABC.

(v) Draw perpendicular bisectors of BC and CA meeting at point O.

(vi) Now draw perpendicular bisector of third side AB.

(vii) We observe that it also passes through O, the point of intersection of first two perpendicular bisectors.

(viii) Hence the three perpendicular bisectors of ΔABC are concurrent at O.

Q.9. Prove that the right bisectors of the sides of a triangle are concurrent. (8)

Ans For Answer see Paper 2017 (Group-I), Q.9.

OR

Prove that triangles on equal bases and of equal altitudes are equal in area.

Ans For Answer see 2014 (Group-II), Q.9(OR).